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| EXAMINER | |
|---|---|
| GEISEL, KARA E | |
| **ART UNIT** | **PAPER NUMBER** |
| 2877 | |

DATE MAILED: 09/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/642,621 | LUDVIKSSON ET AL. | |
| | Examiner | Art Unit | |
| | Kara E. Geisel | 2877 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *19 August 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-51* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-46 and 48-50* is/are rejected.

7)☒ Claim(s) *47 and 51* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Objections*

Claims 22 are objected to because of the following informalities: minor typographical errors.

In regards to claim 22, line 1, the "i" after "monitoring system" should be deleted.

In regards to claim 29, line 3, a period is missing at the end of the claim.

In regards to claim 30, line 10, "awavelength" should be fixed to --a wavelength--.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 42 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 42 recites the limitation "the light emission" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim 49 recites the limitation "said supply" in line 3. There is insufficient antecedent basis for this limitation in the claim.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-6, 10-14, 16, 32, 35-36, 40-41, 43-45 and 48 are rejected under 35 U.S.C. 102(b) as being anticipated by Burnham et al. (USPN 5,947,053).

In regards to claim 1, Burnham discloses a method of monitoring erosion of a system component (column 4, lines 1-10) in a plasma processing system (column 4, lines 11-17), comprising exposing a system component (figs. 3C-F, 302, 303) having a gas emitter (33-34, column 7, lines 35-52) to a plasma process, and monitoring the plasma processing system for release of a sensor gas from the gas emitter during said process to determine erosion of the system component (column 6, lines 47-67 and column 7, lines 38).

In regards to claim 2, exposing comprises exposing a consumable part (column 10, lines 43-59).

In regards to claim 3, the system component can comprise a liner (column 10, lines 43-48).

In regards to claim 10, monitoring comprises using a mass sensor to detect a mass signal (column 3, lines 14-38, and column 4, lines 32-47).

In regards to claim 11, monitoring further comprises determining if the intensity level of mass signal exceeds a threshold value (column 8, lines 22-35).

In regards to claim 12, monitoring further comprises identifying the system component from the mass signal (column 10, lines 43-59).

In regards to claim 13, the monitoring further comprises measuring an intensity level of mass signal to arrive at a determination of whether the component needs to be replaced, and based on the determination, either continuing with the process or stopping the process (column 9, lines 19-40).

In regards to claim 14, the monitoring comprises monitoring for release of at least one of He, Ne, Ar, Kr, and Xe (column 7, lines 38-41).

In regards to claim 16, Burnham discloses a method of monitoring system component status (column 4, lines 1-10) in a plasma processing system (column 4, lines 11-17), comprising exposing a system component (figs. 3C-F, 302, 303) having a gas emitter (33-34, column 7, lines 35-52) to a plasma, wherein the gas emitter contains a sensor gas (column 6, lines 40-41), and monitoring a mass signal from a sensor gas in the plasma processing system during a process (column 3, lines 14-38, and column 4, lines

32-47) the monitoring including using a mass sensor to detect the mass signal and an intensity level of the mass signal (column 3, lines 14-38, and column 4, lines 32-47), identifying the system component from the mass signal (column 10, lines 43-59), and arriving at a determination of erosion level of the system component (column 6, lines 47-67 and column 7, lines 38).

In regards to claim 32, Burnham discloses a monitorable consumable system component (fig. 3C), comprising an system element that is consumed during processing performed by the system (303), and a gas emitter (33) containing a sensor gas (column 7, lines 35-52) coupled to the system element.

In regards to claim 35, a mass signal (column 3, lines 14-38, and column 4, lines 32-47) is used to monitor erosion level of the system component (column 6, lines 61-67).

In regards to claim 36, the system component can comprise a liner (column 10, lines 43-48).

In regards to claim 40, the system component is fabricated from aluminum or stainless steel (column 1, lines 54-67).

In regards to claim 41, the gas emitter is fully encapsulated by the system element (column 7, lines 40-41) to provide a closed volume that contains a fixed amount of sensor gas within the emitter.

In regards to claim 43, a mass signal from the sensor gas (column 3, lines 14-38, and column 4, lines 32-47) allows for identifying the system component (column 10, lines 43-59).

In regards to claim 44, the sensor gas comprises at least one of He, Ne, Ar, Kr, and Xe (column 7, lines 38-41).

In regards to claim 45, the system component further comprises a protective barrier (column 8, lines 50-55).

In regards to claim 48, monitoring comprises monitoring for release of a fixed amount of the sensor gas contained in an enclosed volume of the gas emitter (column 7, lines 40-41).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 4-9, 15, 17-31, 33-34, 37-39, 42, 46, and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burnham et al. (USPN 5,947,053).

In regards to claims 4-6, while it is not specifically disclosed monitoring comprises monitoring at least one gas having fluorescent properties when exposed to the plasma, Burnham does disclose that the emitter could be used with a detection system where emitted light from a plasma is analyzed to measure the presence of the emitter (column 3, lines 57-67), which would indicate that the emitter would need to have been excited by the light produced in the plasma (column 6, lines 47-67) or by a gas species in the plasma (column 7, lines 15-24), to emit light in order to be detected. Furthermore, the monitoring comprises an optical monitoring system to detect the fluorescent light emission (column 6, lines 56-67).

In regards to claim 7, monitoring further comprises determining if the intensity level of the fluorescent emission exceeds a threshold value (column 8, lines 22-35).

In regards to claim 8, monitoring further comprises identifying the system component from a wavelength of the fluorescent light emission (column 10, lines 43-59).

In regards to claim 9, the monitoring further comprises measuring an intensity level of the fluorescent emission to arrive at a determination of whether the component needs to be replaced, and based on the determination, either continuing with the process or stopping the process (column 9, lines 19-40).

In regards to claim 15, Burnham discloses a method of monitoring system component status in a plasma processing system (column 4, lines 2-18) comprising exposing a system component having a gas emitter (column 7, lines 35-52) to a plasma, wherein the gas emitter contains a sensor gas capable of fluorescent light emission (as discussed above) when released from the gas emitter and exposed to the plasma (column 4, lines 11-31), and monitoring fluorescent light emission from the plasma processing system during a process (column 6, lines 47-67), the monitoring including using an optical monitoring system to detect the wavelength and the intensity level of the fluorescent light emission (column 6, lines 56-67), identifying the system component from the wavelength of the fluorescent light emission (column 10, lines 43-59), and arriving at a determination of erosion level of the system component (column 9, lines 19-40).

In regards to claim 17, Burnham discloses a plasma processing system, comprising a system component having a gas emitter wherein the gas emitter contains a sensor gas (column 7, lines 35-52) a monitoring system configured to monitor for the release of the sensor gas from the gas emitter to determine erosion level of the system component (column 6, lines 61-67). Although Burnham does not disclose the rest of the structure of the plasma processing system, conventional systems comprise a plasma processing chamber, a plasma source configured to create a plasma from a process gas, and a controller configured to control the plasma processing system, and therefor it would be obvious to include these components into Burnham's plasma processing system.

In regards to claim 18, the system component comprises a consumable part (column 10, lines 43-59).

In regards to claim 19, the sensor gas comprises at least one gas capable of fluorescent light emission (as discussed above) when excited by a light produced in the plasma (column 4, lines 11-31 and column 6, lines 47-67).

In regards to claim 20, the sensor gas comprises at least one gas capable of fluorescent light emission (as discussed above) when excited by excited gas species produced in the plasma (column 4, lines 11-31 and column 7, lines 15-24).

In regards to claim 21, the monitoring system comprises an optical monitoring system for monitoring the fluorescent light emission from the plasma processing chamber during processing (column 6, lines 56-67).

In regards to claim 22, the monitoring system comprises a mass sensor for monitoring a mass signal from the plasma processing chamber during processing (column 3, lines 14-38, and column 4, lines 32-47).

In regards to claim 23, the system component can comprise a liner (column 10, lines 43-48).

In regards to claim 24, the system component is fabricated from aluminum or stainless steel (column 1, lines 54-67).

In regards to claim 25, the system component further comprises a protective barrier (column 8, lines 50-55).

In regards to claim 26, Burnham does not disclose that the protective barrier is one of these compounds. However, the examiner takes Official Notice that these compounds (such as $Y_2O_3$ and $Sc_2O_3$) are well known in the art, and are conventionally used as a protective barrier on system components in a semiconductor processing system, so that components of the system are subjected to less wear, and therefore, it would have been obvious to one of ordinary skill in the art at the time the invention

was made to use one of these compounds as an alternative to graphite as the protective barrier in Burnham's depending on the availability and cost of the compound.

In regards to claims 27-29, the choice of plasma source is merely a design consideration, and would be obvious to one of ordinary skill in the art depending on the availability of the plasma source at the time.

In regards to claim 30, Burnham discloses a plasma processing system, comprising a system component having a gas emitter (column 7, lines 35-52) wherein the gas emitter contains a sensor gas capable of fluorescent light emission (as discussed above) when exposed to a plasma (column 4, lines 11-31), and an optical monitoring system for monitoring light emission from the plasma processing chamber during processing to monitor erosion level of the system component (column 6, lines 61-67) wherein the optical monitoring system is further configured to identify the system component from a wavelength of the fluorescent light emission (column 10, lines 43-59), to determine if an intensity level of the fluorescent emission exceeds a threshold value to determine if the system component needs to be replaced, and based on the determination, either continuing with the process or stopping the process (column 9, lines 19-40). Although Burnham does not disclose the rest of the structure of the plasma processing system, conventional systems comprise a plasma processing chamber, a plasma source configured to create a plasma from a process gas, and a controller configured to control the plasma processing system, and therefore it would be obvious to include these components into Burnham's plasma processing system.

In regards to claim 31, Burnham discloses a plasma processing system, comprising a system component having a gas emitter (column 7, lines 35-52) wherein the gas emitter contains a sensor gas, and mass sensor for monitoring a mass signal (column 3, lines 14-38, and column 4, lines 32-47) from the plasma processing chamber during processing to monitor erosion level of the system component (column 6, lines 61-67) wherein the mass sensor is further configured to identify the system component from the

mass signal (column 10, lines 43-59), to determine if an intensity level of the fluorescent emission exceeds a threshold value to determine if the system component needs to be replaced, and based on the determination, either continuing with the process or stopping the process (column 9, lines 19-40). Although Burnham does not disclose the rest of the structure of the plasma processing system, conventional systems comprise a plasma processing chamber, a plasma source configured to create a plasma from a process gas, and a controller configured to control the plasma processing system, and therefore it would be obvious to include these components into Burnham's plasma processing system.

In regards to claim 33, the sensor gas is capable of fluorescent light emission (as discussed above) when exposed to a plasma (column 4, lines 11-31)

In regards to claim 34, the light emission is used to monitor erosion level of the system component (column 6, lines 61-67).

In regards to claims 37-39, although Burnham does not disclose explicitly that the annular element is a focus ring, an electrode plate, or a deposition shield, it is disclosed that the emitter should be coupled to any element that could be eroded due to the processes in the in processing system (column 6, lines 37-46), and therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to couple Burnham's emitter to any annular element that would undergo erosion in the processing system, including a focus ring, an electrode plate, or a deposition shield.

In regards to claim 42, the light signal from the sensor gas allows for identifying the system component (column 10, lines 43-59).

In regards to claim 46, Burnham does not disclose that the protective barrier is one of these compounds. However, the examiner takes Official Notice that these compounds (such as $Y_2O_3$ and $Sc_2O_3$) are well known in the art, and are conventionally used as a protective barrier on system components in a semiconductor processing system, so that components of the system are subjected to less wear, and therefore, it would have been obvious to one of ordinary skill in the art at the time the invention

was made to use one of these compounds as an alternative to graphite as the protective barrier in Burnham's depending on the availability and cost of the compound.

In regards to claim 50, the gas emitter comprises a closed volume that is fully encapsulated within the system component to contain a fixed amount of sensor gas within the gas emitter (column 7, lines 40-41).

*Allowable Subject Matter*

Claims 47 and 51 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 49 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

As to claim 47, the prior art of record, taken alone or in combination, fails to disclose or render obvious a monitorable consumable system component comprising a gas supply line configured to connect a gas emitter to a sensor gas source that supplies a sensor gas to the gas emitter, in combination with the rest of the limitations of claim 47.

As to claim 49, the prior art of record, taken alone or in combination, fails to disclose or render obvious a method of monitoring erosion of a system component in a plasma processing system wherein monitoring comprises monitoring for release of a sensor gas from a gas emitter, a supply of sensor gas being supplied from a gas source to the gas emitter, in combination with the rest of the limitations of claim 49.

As to claim 51, the prior art of record, taken alone or in combination, fails to disclose or render obvious a plasma processing system comprising a sensor gas source configured to provide a supply of a

sensor gas, and a gas supply line configured to connect the gas emitter to the sensor gas source in order to supply the sensor gas to the gas emitter, in combination with the rest of the limitations of claim 51.

*Additional Prior Art*

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The prior art made of record is Stack (USPN 5,146,098), Madzsar (USPN 5,187,542), McGahay (USPN 5,712,702), and Oehrlein et al. (USPN 5,798,016).

Stack discloses a method and apparatus of measuring contaminants and residual gases in a plasma processing system by spectrally measuring light generated by the plasma created during processing.

Madzsar discloses a method and apparatus for detecting wear of a system component in a plasma processing system comprising exposing a system to hot gas, the system component containing an emitter capable of fluorescent light emission when exposed to the hot gas, and measuring the fluorescent light emission from the processing system to determine erosion of the system component.

McGahay discloses a method for determining the chamber cleaning endpoint in a plasma processing system comprising exposing the system to a plasma, the component having a layer containing an emitter capable of fluorescent light emissions when exposed to the plasma, and monitoring the fluorescent light emission from the plasma system during cleaning to determine the endpoint of the cleaning.

Oehrlein discloses using $Y_2O_3$ and $Sc_2O_3$ as a protective barrier on a system component in a plasma processing system.

*Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kara E Geisel whose telephone number is **571 272 2416**. The examiner can normally be reached on Monday through Friday, 8am to 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on **571 272 2800 ext. 77**. The fax phone number for the organization where this application or proceeding is assigned is **571 273 8300**.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Gregory J. Toatley, Jr.
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23SEP05

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September 1, 2005